

IN THE CLAIMS:

Claim 29 has been amended. New claim 30 has been added. Please note that all claims currently pending and under consideration in the referenced application are shown below, in clean form, for clarity. Please enter these claims as amended. Also attached is a version with markings to show changes made to the claims.

16. A process for producing alkyl esters useful in biofuels and lubricants, said process comprising:

providing an organic composition comprising one or more components selected from the group consisting of acylglycerols, fats, oils, waxes, and free fatty acids;

providing a critical fluid medium including one or more fluids selected from the group consisting of carbon dioxide, sulfur dioxide, methane, ethane, propane, and mixtures thereof;

dissolving the organic composition and either a C₁-C₄ short chain alcohol or water into the critical fluid medium; and

reacting the organic composition with the short chain alcohol or water in the presence of a catalyst in a single phase to produce a final product comprising an alkyl ester and glycerol, wherein said glycerol leaves the single phase as it is formed;

wherein the particular critical fluid medium is selected so that, when combined with the organic composition, the critical fluid medium provides decreased loss of catalyst or catalytic activity and elimination of mass transfer limitations by maintaining the various reactants in a single phase.

17. The process of claim 16, wherein said short chain alcohol is selected from the group consisting of ethanol, methanol, propanol, butanol, isopropanol and isobutanol.

18. The process of claim 16, wherein said catalyst is a liquid phase catalyst.

19. The process of claim 18, wherein said liquid phase catalyst is selected from the group consisting of HCl, H₂SO₄, HNO₃, NaOH, and KOH.
20. The process of claim 16, wherein said catalyst is a solid phase catalyst.
21. The process of claim 20, wherein said solid phase catalyst is a microporous crystalline solid.
22. The process of claim 20, wherein said solid phase catalyst is an exchange resin with either acidic or basic properties.
23. The process of claim 20, wherein said solid phase catalyst is an inorganic oxide selected from the group consisting of alumina, silica, silica-alumina, boria, oxides of phosphorus, titanium dioxide, zirconium dioxide, chromia, zinc oxide, magnesia, ion exchange resins, silicate catalysts, and calcium oxide either unmodified or modified with chlorine, fluorine, sulfur or an acid or base.
- ~~24. The process of claim 16, wherein said process further comprises:
separating the glycerol from said final product; and
separating the alkyl ester from said critical fluid.~~
25. The process of claim 16, further comprising recycling said critical fluid medium for use in a later reaction.
- ~~26. A process of claim 16, wherein said C₁-C₄ short chain alcohol is dissolved into the critical fluid medium.~~

27. The process of claim 16, wherein said critical fluid medium optionally includes a critical fluid co-solvent selected from the group consisting of methanol, ethanol, butanol, and water.

28. A process for producing alkyl esters useful in biofuels and lubricants, said process comprising:

providing an organic composition comprising one or more components selected from the group consisting of acylglycerols, fats, oils, waxes, and free fatty acids;

providing a critical fluid medium including one or more fluids selected from the group consisting of carbon dioxide, sulfur dioxide, methane, ethane, propane, and mixtures thereof, and optionally including one or more critical fluid co-solvents selected from the group consisting of methanol, ethanol, butanol, and water;

dissolving the organic composition and either a C₁-C₄ short chain alcohol or water into the critical fluid medium;

reacting the organic composition with the short chain alcohol or water in the presence of a catalyst in a single phase to produce a final product comprising an alkyl ester and glycerol, wherein said glycerol leaves the single phase as it is formed;

separating said glycerol from said final product by modifying the temperature and pressure of the final product; and

separating said alkyl ester product from said critical fluid by modifying the temperature and pressure of the critical fluid medium.

29. (Amended) A process for producing alkyl esters useful in biofuels and lubricants, said process comprising:

providing an organic composition comprising one or more components selected from the group consisting of acylglycerols, fats, oils, waxes, and free fatty acids;

providing a critical fluid medium including one or more fluids selected from the group consisting of carbon dioxide, sulfur dioxide, methane, ethane, propane, and mixtures thereof;

dissolving the organic composition and either a C₁-C₄ short chain alcohol or water into the critical fluid medium; and

reacting the organic composition with the short chain alcohol or water in the presence of a catalyst at a temperature from about 20°C to about 200°C and a pressure from about 150 psig to about 4000 psig, wherein the reaction occurs in a single phase to produce a final product comprising an alkyl ester and glycerol and wherein said glycerol leaves the single phase as the glycerol is formed;

wherein the critical fluid is one selected to have a critical temperature within [about] 20% of the reaction temperature and a critical pressure as modified by a co-solvent within a range of [about] 0.5 to about 15 times the reaction pressure.

30. A process for producing alkyl esters useful in biofuels and lubricants, said process comprising:

providing an organic composition comprising one or more components selected from the group consisting of acylglycerols, fats, oils, waxes, and free fatty acids;

dissolving the organic composition and a C₁-C₄ short chain alcohol or water into a critical fluid medium, wherein the critical fluid medium is one or more fluids selected from the group consisting of carbon dioxide, sulfur dioxide, methane, ethane, and propane, and

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mixtures thereof, the critical fluid medium solubilizing the organic composition and the C₁-C₄ short chain alcohol or water into a single phase;

reacting the organic composition with the C₁-C₄ short chain alcohol or water in the presence of a catalyst in the single phase; and

producing a final product comprising an alkyl ester and glycerol, wherein the glycerol is separated from the alkyl ester by controlling the temperature and pressure of the reaction conditions.